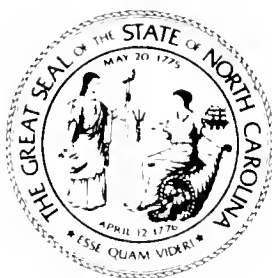


REPORT OF THE NEUSE RIVER BASIN WATER QUALITY STUDY COMMISSION



**REPORT TO THE
1985 GENERAL ASSEMBLY
OF NORTH CAROLINA**

REPORT OF THE NEUSE RIVER BASIN WATER QUALITY STUDY COMMISSION



**REPORT TO THE
1985 GENERAL ASSEMBLY
OF NORTH CAROLINA**

A LIMITED NUMBER OF COPIES OF THIS REPORT IS AVAILABLE
FOR DISTRIBUTION THROUGH THE LEGISLATIVE LIBRARY.

ROOM 2126, 2226
STATE LEGISLATIVE BUILDING
RALEIGH, N.C. 27611
TELEPHONE: (919) 733-7778

OR

ROOM 500
LEGISLATIVE OFFICE BUILDING
RALEIGH, N. C. 27611
TELEPHONE: (919) 733-9390

NORTH CAROLINA GENERAL ASSEMBLY
LEGISLATIVE SERVICES OFFICE
2129 STATE LEGISLATIVE BUILDING
RALEIGH 27611

GEORGE R. HALL, JR.
LEGISLATIVE ADMINISTRATIVE OFFICER
TELEPHONE 733-7044

GERRY F. COHEN, DIRECTOR
LEGISLATIVE DRAFTING DIVISION
TELEPHONE 733-6660

THOMAS L. COVINGTON, DIRECTOR
FISCAL RESEARCH DIVISION
TELEPHONE 733-4910



M. GLENN NEWKIRK, DIRECTOR
LEGISLATIVE AUTOMATED SYSTEMS DIVISION
TELEPHONE 733-6834

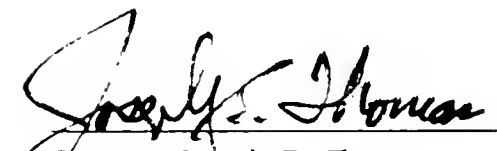
TERRENCE D. SULLIVAN, DIRECTOR
RESEARCH DIVISION
TELEPHONE 733-2578

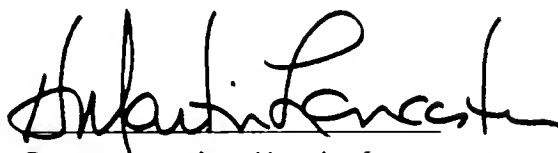
January 25, 1985

TO THE MEMBERS OF THE 1985 GENERAL ASSEMBLY:

The Neuse River Water Quality Study Commission herewith reports to the 1985 General Assembly of North Carolina under the authority of Chapter 924 of the 1983 Session Laws.

Respectfully submitted,


Senator Joseph E. Thomas


Representative Martin Lancaster

Co-chairmen

Neuse River Water Quality Study Commission

Table of Contents

Letter of Transmittal	i
Preface	ii
Introduction	1
Statement of Problem	1
Search for Solutions	2
A. Commission Member Insights	2
B. Options from NRCD	2
1. Nutrient Sensitive Water Designation	3
2. Neuse River Work Plan	3
C. River Center Project	3
D. Summary of Principles	4
Finding	5
Recommendation: Appropriation for Work Plan	5
<u>Appendix A</u>	
Membership List	A1
Text of Chapter 924	A2
Neuse River Basin Map	A3
<u>Appendix B</u>	
Jamie King Statement	B1
Donald Cox Outline	B2
<u>Appendix C</u>	
Neuse River Status Report and Work Plan	C1
<u>Appendix D</u>	
Neuse River Work Plan Appropriation	D1

PREFACE

The Neuse River Water Quality Study Commission was authorized under Chapter 924 of the 1983 Session. (See Appendix A for the text of the Act). The membership of the Commission consists of both legislators and private citizens. (See Appendix A for list of membership). Section 2 of Chapter 924 charges the Commission and the Department of Natural Resources and Community Development to "jointly conduct an extensive review of water pollution problems and water resources needs of the Neuse River Basin." The Act directed the Commission to investigate the causes of water quality degradation in the Neuse River Basin and recommend action towards a water quality management plan.

The Commission held three meetings (December 2, 1983; December 20, 1984; January 25, 1985) and the following is its Final Report.

INTRODUCTION

The Neuse River Basin is the second largest river basin in North Carolina and lies entirely within the State's borders. Draining over 6,200 square miles, the river begins in the Piedmont region near Durham, flows into the Falls of the Neuse reservoir and cuts its way through the Coastal Plain by Clayton, Kinston and Goldsboro, finally emptying into the Pamlico Sound nearly 222 miles from its headwaters. The upper one-third of the river is within the Piedmont Region and the lower two-thirds in the Coastal Plain. In the area around New Bern, where the river widens substantially, the flow pattern changes as fresh and salt water mix, moving up and down the river. The Neuse River provides irrigation, recreation, jobs and drinking water for the people and communities along its banks. A map of the Neuse River Basin can be found in Appendix A.

STATEMENT OF THE PROBLEM

The central water quality problem experienced by the Neuse River is eutrophication - - that is, the overenrichment of the waters with nutrients such as nitrogen and phosphorus resulting in algal blooms. First appearing as a noticeable problem in the early 1970's, these blooms have been the subject of field and laboratory studies by the Department of Natural Resources and Community Development (NRCD) and others since 1979. These studies have definitely implicated nutrient loading as a major cause of water quality degradation in the Neuse. The presence of recurrent blooms during dry summers also implicates high water temperature and low flow rates as contributing ingredients in forming this algal "soup". The interested reader can consult NRCD's 1983 Neuse River Phytoplankton Summary (Report No. 84-06, May 1984) for a more detailed view of this problem.

Of course, nutrient enrichment must come from some source, and it is not hard, in a general sense, to identify the culprits. For instance, harvested cropland along the Neuse has increased 30% from 1967 to 1980. There has been a 20% increase in population in the basin. The basin has become more industrialized. Overall, there are approximately 250 permitted point sources discharging 180 million gallons of wastewater per day into the river.

Point sources, though, are not the only nutrient loaders. NRCD estimates that 80% of the nitrogen in the Neuse comes from non-point sources, such as agriculture, urban runoff, and forests, while the phosphorus split between point and non-point sources is fifty-fifty. More information can be found in NRCD's December 20 Neuse River Status Report set out in Appendix C.

THE SEARCH FOR SOLUTIONS

The identification of the general scientific and demographic causes of the Neuse's water quality problems is the beginning, not the end, in the search for solutions.

A. Commission Member Insights

Commission members have individually advanced principles and ideas that should guide public policy in cleaning up the Neuse. At the December 20 meeting, Mr. Jamie King argued that one of the factors that should be addressed in a management strategy is the cumulative impact of the non-conventional pollutants, such as nutrients, on a basinwide basis over time. Integral to this approach is the identification of thresholds, or ceilings, for these cumulative effects, projections of growth patterns and resource needs in order to issue permits prospectively and an institutional setting for policy and planning. A copy of his statement is in Appendix B.

Mr. Donald Cox offered the idea of land discharge (as, for example, through spray irrigation) by small point-dischargers. He also argued for assistance to cities in the development of better design for waste treatment facilities and an expansion of industrial pretreatment programs. He suggested continuation and expansion of the Nutrient Sensitive Water Program (see below) was worthy of consideration. An outline of his comments is in Appendix B.

B. Options From NRCD

As part of its mandate, the Commission has worked extensively with NRCD. Besides furnishing technical data, the Department has briefed the Commission on options and strategies. Principally they are the following:

1. Nutrient Sensitive Water Designation. Currently, the Environmental Management Commission is weighing the appropriateness of a Nutrient Sensitive Water designation (NSW) for the Neuse River Basin. Funded by the 1983 General Assembly (Regular Session 1984) and currently applied to the Chowan River Basin and to the Falls and Jordan Lakes, a NSW classification mandates "no increase in nutrients over background levels" and means stricter effluent standards. Of course, this implies higher costs to certain dischargers along with the benefits for all in better water quality. An important aspect of the designation is eligibility for the cost-share program in agriculture. Designed to encourage Best Management Practices (BMP) by farmers, this program pays up to 75% of the share for conservation improvements that will reduce nutrient runoff. Since 80% of the nitrogen and 50% of the phosphorus that enter the Neuse come from non-point sources (not all agriculture), this program has the potential to reduce significantly unwanted nutrient discharges.

2. Neuse River Work Plan. This was presented to the Commission on December 20. It consists of those items which NRCDC considers necessary for a comprehensive assessment for action on the Neuse's problems. A central intent to this plan is to focus on the actual polluters to enable regulators subsequently to frame equitable and cost-effective solutions. A copy of that presentation may be found in Appendix C.

C. Private Sector Creativity - The River Center Project

At its December meeting, the Commission was very pleased to hear from Mr. John Ward of the efforts of the Union Point Task Force in New Bern. Beginning only two years ago with a dream, this group of private citizens has assembled six acres of land at the confluence of the Neuse and Trent Rivers. The group recently completed holding a design competition for the projected construction of a river center. As envisioned, this center

would serve recreational, educational and research functions. It would have aquariums, meeting rooms and places for scientific research and study. Mr. Ward mentioned two subjects of special interest to researchers: The salt water "wedge" that travels up and down the Neuse and the natural fish nurseries in the estuaries. Mr. Ward projects that the center will cost about \$3 million to complete.

The Commission commends the Union Point Task Force for its energetic private sector efforts which combine recreation, education, research and urban revitalization in one project. There are several institutes in this country which research the oceans. The Commission feels that a center researching a freshwater river - - in this case, one wholly in North Carolina - - is a great step forward.

D. Summary of Principles

From the information and testimony received and from its deliberation, the Commission recognizes:

1. That significant development has occurred in the Neuse River Basin and will continue to occur in the future. People engaging in productive economic activity are not in themselves the problem, but the unintentional and unwanted side-effects need to be lessened.
2. That intelligent solutions to the Neuse's problems require not only an appreciation of the scientific mechanisms in general but also specific knowledge regarding discrete segments of the river. Only with this type of knowledge can the state frame those solutions which are least economically burdensome to the people and communities involved.
3. That the best solutions are those which engage people and communities in innovative and cooperative undertakings and yield the most tangible benefits at the least relative cost.

FINDING

The Commission finds: That the problem of nutrient loading in the Neuse River Basin is significant and growing. At its meetings, the Commission received information and heard testimony from numerous sources that the water quality of the Neuse River is being degraded by excessive algal growth (eutrophication) caused by too much nutrient loading and that, without action, this problem is likely to get worse. Scientific research has shown the general chemical and biological mechanisms involved. Thousands including some Commission members, have personally witnessed the algal blooms. Solutions need to be found to restore the Neuse River to its former health so that the jobs, agriculture, health, drinking water and future natural resources of the public can be protected.

RECOMMENDATION

The Commission recommends: That the General Assembly should pass legislation implementing the development of a water quality management plan for the Neuse River Basin, as set out in Appendix D. The description of this initiative, along with a Neuse River Status Report, is set out in Appendix C. The Commission endorses this initiative as a cost-effective and necessary step in the implementation of a Neuse River action plan. The plan shall include a study of the cost/benefit ratio and financial impact to the point and non-point dischargers in the basin. Such a proposal is also in accord and compliance with the intent of Chapter 924, establishing this Commission, which called for the development of such a plan.

APPENDIX A

NEUSE RIVER BASIN WATER QUALITY MANAGEMENT PLAN

LEGISLATIVE COMMISSION MEMBERSHIP LIST

House Appointments

Rep. Martin Lancaster (Co-Chairman)
P. O. Box 916
Goldsboro, N.C. 27530 (919) 735-7275

Rep. George Brannan
Route 4, Box 134
Smithfield, N. C. 27577 (919) 934-8877

Rep. Ray Sparrow
Sparrow Construction Co.
3815 Hillsborough St.
Raleigh, N. C. 27607 (919) 833-7341

Mr. Jud M. Ammons
140 Ammons Drive
Raleigh, N. C. 27609 (919) 847-5460

Mr. William Sparrow
3320 Clark Road
Durham, N. C. (919) 688-3753

Senate Appointments

Sen. Joe Thomas, (Co-Chairman)
P. O. Box 337
Vanceboro, N. C. 28586 (919) 353-7000

Sen. Henson Barnes
P. O. Drawer 7
Goldsboro, N. C. 27530 (919) 735-6420

Sen. Harold Hardison
P. O. Box 128
Deep Run, N. C. 28525 (919) 568-3131

Mr. Donald N. Cox
122 East Queen Street
Hillsborough, N. C. 27278 (919) 732-2870

Mr. Jamie H. King, Jr., Pres.
Neuse River Foundation, Inc.
P. O. Box 5451
New Bern, N. C. 28560 (919) 638-4131
Ex. 309

Legislative Counsel

Mr. Daniel Long
Room 545 Legislative Office Building
Raleigh, N. C. 27511 (919) 733-2578

Commission Clerk

Mrs. Pat Misner
Room 2009 Legislative Building
Raleigh, N. C. 27511 (919) 733-5659

GENERAL ASSEMBLY OF NORTH CAROLINA
SESSION 1983
RATIFIED BILL

CHAPTER 924
SENATE BILL 605

AN ACT TO APPROPRIATE FUNDS FOR THE DEVELOPMENT OF A WATER QUALITY MANAGEMENT PLAN FOR THE NEUSE RIVER BASIN AND TO CREATE A LEGISLATIVE COMMISSION TO REVIEW WATER POLLUTION PROBLEMS AND WATER RESOURCES NEEDS, AND OVERSEE THE DEVELOPMENT OF THE NEUSE RIVER BASIN WATER QUALITY MANAGEMENT PLAN.

The General Assembly of North Carolina enacts:

Section 1. Creation of the Commission; Membership; Chairmen. There is created the Legislative Commission to oversee the development of the Neuse River Basin Water Quality Management Plan. The Commission shall consist of 10 members appointed as follows:

(1) Three members of the Senate appointed by the President of the Senate, one of whom shall be designated a cochairman of the Commission;

(2) Two nonlegislative members appointed by the President of the Senate who are residents of the Neuse River Basin area;

(3) Three members of the House of Representatives appointed by the Speaker of the House of Representatives, one of whom shall be designated a cochairman of the Commission.

(4) Two nonlegislative members appointed by the Speaker who are residents of the Neuse River Basin area.

Sec. 2. Duties of the Commission. The Commission and the Department of Natural Resources and Community Development shall jointly conduct an extensive review of water pollution problems and water resources needs of the Neuse River Basin. Ongoing analysis and monitoring of algal problems in the Neuse River Basin shall be intensified to result in the development of the "Neuse River Basin Action Plan" by June 1, 1984. A preliminary report that will include, to the extent possible, any needed action and/or legislation necessary to improve the water quality of the Neuse River shall be submitted to the General Assembly by February 1, 1985. A final "Neuse River Basin Water Quality Management Plan" shall be submitted to the General Assembly by May 1, 1986.

The interim report may be in the form of a progress report, but the final report shall specify:

(1) actions necessary to reduce algal growth to acceptable levels;

(2) the impact of contributors in the Neuse Basin on water quality conditions in the Lower Neuse Basin;

(3) steps to control harmful contributions in the Neuse Basin that have detrimental effects on water quality conditions in the entire Neuse Basin;

(4) the feasibility of establishing a phosphate detergent ban in the Neuse River Basin;

(5) the effect such a ban is likely to have on phosphorous contributions basinwide;

(6) a determination of the ecological health of the Neuse River with regard to water quality parameters. In addition, the Commission shall evaluate the efforts of the Department of Natural Resources and Community Development related to water quality evaluations in the Neuse River Basin.

Sec. 3. Staff. The Legislative Services Officer shall provide professional assistance as directed by the Legislative Services Commission. The Department of Natural Resources and Community Development shall provide the technical expertise required by the Commission.

Sec. 4. Travel and Subsistence Allowances. Legislative members of the Commission shall receive subsistence and travel allowances according to the provisions of G.S. 120-3.1. Nonlegislative members of the Commission shall receive per diem compensation and travel expenses as provided by G.S. 138-5.

Sec. 5. Of the funds appropriated to the General Assembly in Section 2 of Chapter 761 of the 1983 Session Laws, the General Assembly may use sufficient amounts to carry out the provisions of this act, including payments to the Department of Natural Resources and Community Development, if authorized by the Legislative Services Commission.

Sec. 6. This act is effective upon ratification.

In the General Assembly read three times and ratified, this the 22nd day of July, 1983.

JAMES C. GREEN

James C. Green
President of the Senate

LISTON B. RAMSEY

Liston B. Ramsey
Speaker of the House of Representatives

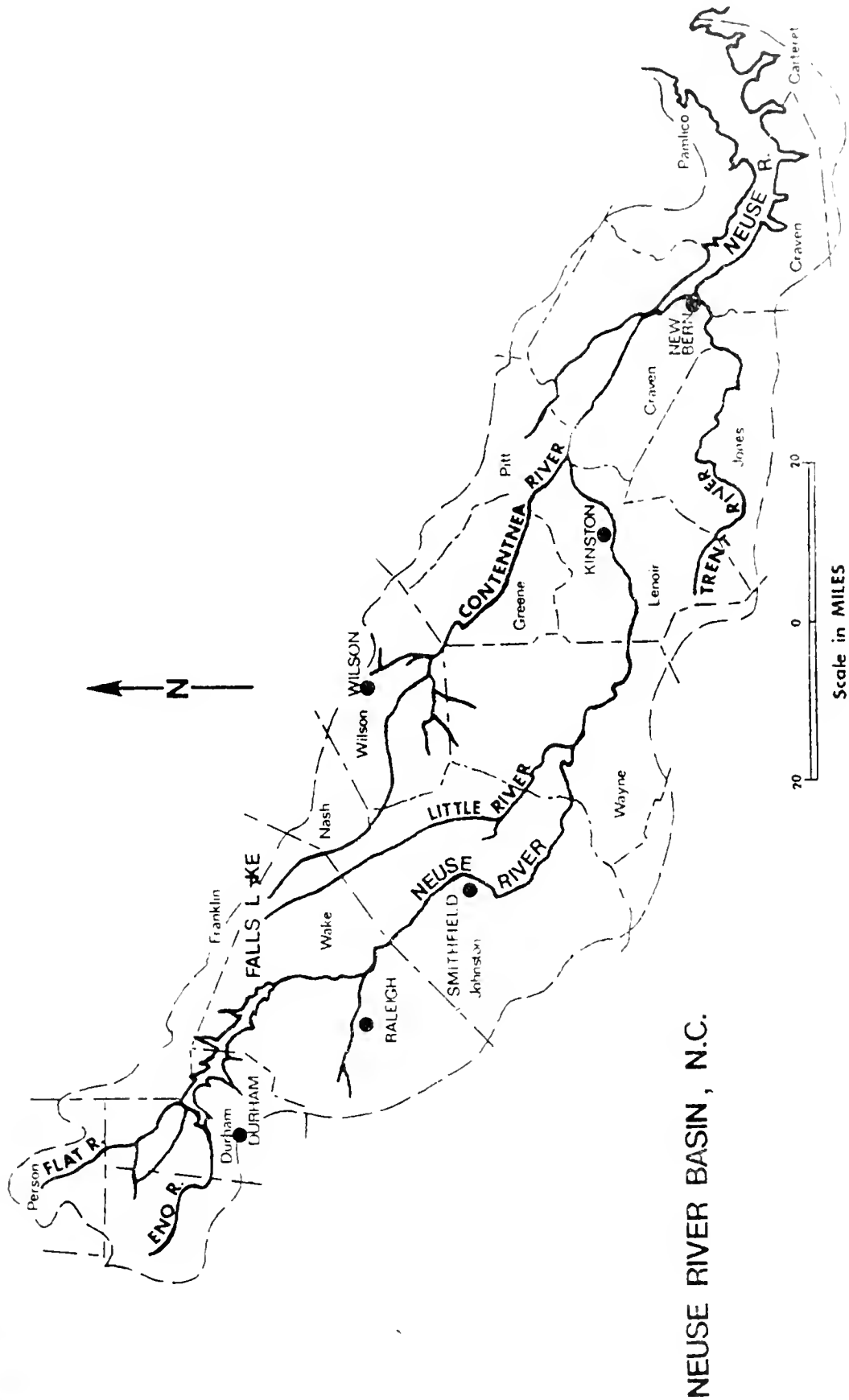


Figure 1. The Neuse River drainage basin.

APPENDIX B

Jamie H. King, Jr.

112 RICHARDSON ROAD • P. O. BOX 2014 • NEW BERN, NORTH CAROLINA 28561

Senator Thomas
Representative Lancaster
Members of the Neuse River Basin Study Commission

The charge of this Commission is to develop a Management Strategy for the Neuse River Basin, which we all know to be enduring considerable stress at this time. The concept of a Management Strategy involves the keyword MANAGEMENT, which implies awareness of and accounting for all of the many pertinent factors in the water quality of the river.

One of those factors, which is seldom address but should be considered, is the cumulative impacts of nonconventional pollutants, such as nutrients. The basinwide approach which has been used and is being used by this Commission needs to include consideration of accumulative effects both over space and over time, and it is the latter which perhaps ought to receive more attention than it now does.

The problem of accumulative impact over time is especially critical because there is no regulatory mechanism currently in place to deal with it. Development is currently dealt with on a permit-by-permit basis.

This is a problem which requires both research and development of a system to manage the overall time-accumulated effects on water quality. It is necessary to do three things: (1) identify thresholds for the effects of cumulative impacts ("ceilings"); (2) project future growth patterns and resource needs in order to issue permits prospectively; and (3) provide an institutional basis of policy and planning for decision making.

It would probably be most effective to have DNREC take the lead in developing a methodology to manage cumulative impacts, particularly with regard to development. This might include a memorandum of understanding among the resource management agencies involved, in order to coordinate permitting processes. Establishing a management framework which takes the cumulative effects into account might also require legislative action.

Much of the baseline data necessary for setting up such a management system now exists, although in a fragmented and dispersed form. In addition, sophisticated modelling and more knowledge of assimilative capacities will be required.

This matter is brought to the attention of the Commission in order that its report to the Legislature regarding the Neuse River Management Strategy include its consideration.

Points - Base Line

1. Problems are both point and non-point
2. Any pollution loading has a very long lifetime in the estuary
3. Growth rates of our forests are nutrient and water limited, 50% increases are possible
4. Moderately good soils are capable of assimilating approximately 1 MGD/250 Ac. on a 7 day average basis. More land needed for retention ponds for wet weather periods.
5. Large metropolitan areas have the economic capability of financing the more sophisticated waste treatment systems, where small towns and communities may not have the same resource capability.

A combination of the following may be a strategy for management:

1. Continue & expand the nutrient-sensitive water program for agriculture.
2. Seek assistance for urban N.P. Measures for towns and cities , possibly through community assistance/revenue-sharing programs, clean water bonds, etc.
3. Encourage small point dischargers (<2-3mad) to develop land discharge systems or treated effluent such as spray irrigation or forest management areas.
4. Assist larger metropolitan areas in the design/construction of adequate treatment systems, where land discharge would require unavailable amounts of land and would seriously reduce downstream flows if not returned to surface waters.
5. Continue and expand the industrial pre-treatment program, to render the point discharges less harmful, and where land discharge is used to prevent early depletion of the soil absorption capability or metal compounds and other toxic materials.

APPENDIX C

NEUSE RIVER BASIN WATER QUALITY

STUDY COMMISSION

DECEMBER 20, 1984

PREPARED BY: THE DIVISION OF ENVIROMENTAL MANAGEMENT

WATER QUALITY SECTION

NEUSE RIVER STATUS REPORT

THE NEUSE RIVER IS A RESOURCE OF IMMENSE IMPORTANCE TO THE STATE OF NORTH CAROLINA. THIS SYSTEM IS USED EXTENSIVELY BY THE CITIZENS OF NORTH CAROLINA FOR WATER SUPPLY, INDUSTRY, RECREATION, AND COMMERCIAL AND SPORT FISHING.

THE NEUSE RIVER BASIN IS THE SECOND LARGEST BASIN IN NORTH CAROLINA AND LIES ENTIRELY WITHIN THE STATE'S BOUNDARIES. THE BASIN DRAINS OVER 6,200 SQUARE MILES FROM ITS HEADWATERS IN THE PIEDMONT REGION NEAR DURHAM INTO A NEWLY IMPOUNDED RESEVOIR, FALLS OF THE NEUSE, INTO THE COASTAL PLAIN THROUGH CLAYTON, KINSTON, AND GOLDSBORO UNTIL BROADENING NEAR NEW BERN AND EMPTYING INTO THE PAMLICO SOUND 222 MILES FROM ITS ORIGIN.

ONE OF THE MOST CRITICAL ENVIRONMENTAL ISSUES FACING THIS SYSTEM IS EUTROPHICATION; THAT IS THE OVERENRICHMENT OF THESE WATERS WHICH HAS RESULTED IN OBJECTIONABLE GROWTH OF AQUATIC PLANTS.

SINCE THE EARLY 70'S THERE HAVE BEEN REPORTS OF ALGAL BLOOMS FROM VARIOUS LOCATIONS ALONG THE NEUSE, WITH A MAJOR SURFACE BLOOM OCCURRING IN 1978. SINCE THAT TIME THE DIVISION HAS BEEN INTENSIVELY MONITORING AND EVALUATING THE SYSTEM IN AN EFFORT TO BETTER UNDERSTAND THE PROBLEM AND ESTABLISH A COURSE OF ACTION NECESSARY TO PROTECT THIS SYSTEM AND REVERSE THE ALARMING TREND OF EUTROPHICATION.

A RELATED FACTOR OF CONCERN TO WATER QUALITY ON THE NEUSE RIVER IS THE CHANGING LAND USE AND SOCIAL PATTERNS WITHIN THE BASIN. DATA INDICATES THAT HARVESTED CROPLAND IN THE BASIN INCREASED OVER 30% FROM 1967 - 1980. THE CENSUS BUREAU REPORTS OVER A 20% INCREASE IN POPULATION, WITH THIS RATE CONTINUING TO ACCELERATE. THESE CHANGES NOT ONLY HAVE IMPLICATIONS

CONCERNING WATER QUALITY IMPACTS, BUT SERVE TO STRESS THE IMPORTANCE OF PROTECTING THIS RESOURCE FOR CONTINUED ECONOMIC GROWTH IN THIS REGION.

TO ASSESS THE PROBLEMS WITH EUTROPHICATION ON THE NEUSE RIVER, MANY WATER QUALITY PARAMETERS WERE CONSIDERED INCLUDING ESTIMATES OF CHLOROPHYLLA WHICH IS A GOOD INDICATOR OF TOTAL AMOUNTS OF ALGAE PRESENT AT A GIVEN TIME. AVERAGE SUMMERTIME CHLOROPHYLLA VALUES IN 1971 WERE 9.5 MG/L AND INCREASED TO 35.75 MG/L IN 1980 AND 40.5 MG/L IN 1982. DURING THE BLOOM IN AUGUST OF 1983 DRS. STANLEY AND PAERL REPORTED CHLOROPHYLL VALUES OF 1700 MG/L (=42 TIMES OUR WATER QUALITY STANDARD).

OF EVEN MORE CONCERN ARE THE TYPES OF ALGAE RESPONSIBLE FOR THESE ELEVATED CHLOROPHYLLA VALUES. A HEALTHY BODY OF WATER USUALLY CONTAINS A MIXTURE OF MANY GROUPS OF ALGAE THUS ALLOWING A "MIXED BAG" FOR THE FOOD CHAIN. PROBLEMS OCCUR WHEN ONE GROUP OF ALGAE IS ABLE TO OUT COMPETE ALL OTHERS AND GROW AND REPRODUCE UNTIL SOMETHING LIMITS THAT GROWTH. IN THE PAST FEW YEARS, DURING LOWFLOW SUMMERTIME CONDITIONS, A BLUE-GREEN ALGAE (ANACYSTIS CYANAE ALSO CALLED MICROCYSTIS AERUGINOSA) HAS OUT COMPETED ALL OTHER SPECIES. THIS SPECIES CONTAINS GAS VACUOLES WHICH MAKE IT BUOYANT, ALLOWING IT TO COME TO THE SURFACE, SHADE OUT ITS COMPETITION AND REPRODUCE RAPIDLY, FORMING SURFACE SCUMS AS IT DID OVER MUCH OF THE LOWER SECTIONS OF THE NEUSE IN 1983.

NUTRIENT AVAILABILITY, LIGHT, TEMPERATURE, AND FLOW ARE SEVERAL IMPORTANT FACTORS IN THE PROMOTION AND PERPETUATION OF BLUE-GREEN ALGAL BLOOMS. TWO MAJOR NUTRIENTS NECESSARY FOR GROWTH IN ALGAE AS IN LAND PLANTS ARE NITROGEN AND PHOSPHORUS. THE LEVELS OF BOTH OF THESE NUTRIENTS AVAILABLE TO PHYTOPLANKTON IN THE NEUSE RIVER FAR EXCEED THOSE NECESSARY FOR EXCESSIVE GROWTH. AVAILABLE LIGHT AND TEMPERATURE VARY LITTLE FROM

YEAR TO YEAR IN THE LATE SUMMER BUT FLOW CAN VARY DRAMATICALLY. RESULTS HAVE SHOWN THAT LOW FLOWS IN THE LATE SUMMER ALLOW THE BLUE-GREENS THE TIME NECESSARY TO DOMINATE THE SYSTEM AND THAT HIGH FLOWS SERVE TO "WASH-OUT" OR CONTROL EXCESSIVE GROWTH. BUT WE HAVE NO CONTROL OF METEOROLOGICAL CONDITIONS SO WE MUST IDENTIFY AND CONTROL THE SOURCES OF OUR NUTRIENTS.

IT IS ESTIMATED THAT 80% OF THE NITROGEN ENTERING THE NEUSE IS DERIVED FROM NON-POINT SOURCES SUCH AS AGRICULTURE, URBAN RUNOFF AND FORESTED AREAS. THUS, THE REMAINING 20% COMES FROM POINT SOURCES. ON THE OTHER HAND, IT IS ESTIMATED THAT 50% OF THE PHOSPHORUS COMES FROM POINT SOURCES AND 50% FROM NON-POINT SOURCES. WITHIN THE BASIN, THERE ARE OVER 250 PERMITTED POINT SOURCES WITH A COMBINED WASTE FLOW OF 180 MILLION GALLONS PER DAY ENTERING THE SYSTEM.

SO, THE PROBLEMS ARE OBVIOUS, BUT WHERE DO WE GO FROM HERE AND AT WHAT PACE.

THE DIVISION IS CURRENTLY EVALUATING DESIGNATION OF THE ENTIRE NEUSE BASIN AS NUTRIENT SENSITIVE WATERS. THE NEUSE IS CERTAINLY EXPERIENCING EXCESSIVE GROWTHS OF MICROSCOPIC VEGETATION. ALL RESEARCH TO DATE INDICATES BENEFITS WOULD BE DERIVED FROM THE CONTROL OF BOTH NITROGEN AND PHOSPHORUS. PRELIMINARY ESTIMATES OF 70-90% REDUCTION IN TOTAL PHOSPHORUS CONCENTRATIONS, COUPLED WITH REDUCTIONS IN NITROGEN WOULD BE NECESSARY TO LIMIT EXCESSIVE GROWTH UNDER OPTIMUM GROWTH CONDITIONS IN THE NEUSE RIVER. SIGNIFICANT REDUCTIONS IN BOTH NITROGEN AND PHOSPHORUS ENTERING THIS BASIN CAN ONLY BE ACHIEVED THROUGH POINT AND NON-POINT SOURCE REDUCTIONS. WHILE REFINEMENT OF THESE ESTIMATES WILL REQUIRE FURTHER RESEARCH AND CONTINUED MONITORING, THERE IS LITTLE NEED TO EXPECT IMPROVEMENTS IN THE EUTROPHICATION PROBLEM

ON THE NEUSE RIVER WITHOUT ACTION.

SO IT IS EVIDENT THAT AN ENORMOUS PROBLEM EXISTS AND ADDRESSING THIS PROBLEM AND UNANSWERED QUESTIONS WILL REQUIRE ADEQUATE FUNDING. TO DATE ALL WORK WITHIN THIS DIVISION HAS BEEN ACCOMPLISHED BY USE OF OUR BASE APPROPRIATIONS. THE FUNDS REQUESTED BY THIS COMMITTEE IN DECEMBER OF 1983 WERE NOT RECEIVED BY THE NRCD. IF THE NEUSE RIVER WERE DESIGNATED "NUTRIENT SENSITIVE", IT WOULD THEN FALL UNDER THE SPECIAL APPROPRIATIONS OF THE SHORT SESSION OF THE GENERAL ASSEMBLY. THE DIVISION HAS REQUESTED AN EXPANSION OF THOSE FUNDS TO BE CONSIDERED DURING THE UPCOMING SESSION OF THE GENERAL ASSEMBLY, WHICH WOULD ASSIST IN OUR EFFORTS IN NSW WATERS.

Neuse River Work Plan

Numerous issues must continuously be addressed by our environmental programs. Many of these issues are extremely complex and requires extensive expertise and manpower to effectively evaluate and manage. Eutrophication of our State's waters is a concern which must be addressed to protect our State's vital natural resources.

A major river system that is experiencing alarming eutrophication trends and necessitates immediate attention is the Neuse River System. The Neuse River is a resource of immense importance to the State of North Carolina. This resource is used by citizens for water supply, industry, recreation and commercial and sport fishing. This resource is priceless and irreplaceable to North Carolina and immediate actions are necessary if its current uses are to continue.

The Division of Environmental Management has been intensively monitoring and evaluating the Neuse basin since 1978 within funding capabilities. This effort has documented increasing eutrophication at alarming rates. In view of the information available, it is imperative that a basinwide action plan be developed and implemented to reduce these algal growths in the river system.

Additional resources are required by the Division of Environmental Management to intensify its efforts in the basin to develop a basin-wide water quality management plan. Although a good data base has been obtained in recent years, additional river, non-point, and point source data is necessary to formulate an accurate and effective management plan. Detailed analysis of existing and new data will be required as well as extensive nutrient modeling of the system.

A key component of the work plan will be the development of a detailed nutrient budget for the basin. This effort is necessary to ensure that future actions will be focused on these contributors in an equitable fashion and to ensure sufficient information to evaluate those contributors. The development of the nutrient budget will require several investigative aspects. Sediment uptake and release mechanisms must be monitored and evaluated, and algal assay work will be necessary to predict critical levels of nutrients reduction necessary to reduce algal growth. Detailed evaluations of nutrient contributors whether non-point source or point source will be essential to an effective management plan. Evaluation of critical areas of non-point source

input will be essential to an effective management plan. Critical areas of non-point sources must be identified to prioritize best management practice requirements and needs.

Key issues which require further investigation and will be addressed initially are as follows:

- A) What are desirable levels of algal growth for the lower Neuse River?
- B) What levels of nutrient reductions will be necessary to obtain desirable algal populations?
- C) Which tributaries and/or sections of the river system are the major contributors of nutrients?
- D) What are the point/or non-point activities contributing these nutrients?
- E) Are changes in regulations necessary to control inputs of nutrients to the Neuse Basin?

Additional questions that will be addressed over a longer period (2-3 years) include the following:

- 1) Is the Falls Reservoir effective in trapping nutrients from the upper basin and what is the impact on downstream nutrient concentrations? Would additional impoundments benefit the water quality of the lower Neuse basin?
- 2) What is the effectiveness of BMP programs for reducing agricultural and silvacultural inputs of nutrients?
- 3) Would a phosphate detergent ban provide sufficient reductions in point source phosphorus contributions?
- 4) What are desirable species of algae for a healthy phycological food chain and what nutrient levels and nutrient balances are necessary to maintain such populations?
- 5) What would be the short and long term effects of changing the system from a predominantly nitrogen limited system to a phosphorus limited system?

The Division will periodically report back at the Legislative Study Commission on the progress, through the project period.

In order for the Division to accomplish the work effort as outlined, additional staffing is required. Four positions and sufficient operational support will include two Environmental Scientist and two Environmental Technicians. The proposed budget for the three staff positions and operational support fund are \$209,491 per year over a three year period to complete necessary actions to prepare a detailed management plan. The previously submitted budget was

\$127,000 per year. Upon additional review the Division feels that algal assay capabilities will be essential to accomplish our goals, thus the projected amount has been increased to \$209,491/year.

As the previous information has detailed the projected work plan, the following pages detail the budget request as well as provide a draft bill for the appropriations of funds for this project.

NEUSE RIVER NUTRIENT STUDY

Staff Requirements

(2) Environmental Scientist

(2) Environmental Engineering Technician II

Salaries + Fringe = \$89,990

Operational Support

2100	Household, Clothing and Supplies	\$ 700.00
2300	Education, Medical and Agriculture Supplies	4,000.00
2400	Construction and Repair	400.00
2500	Motor Vehicle Operations	6,000.00
2600	Office Supplies and Materials	800.00
2900	Film Supplies	300.00
2910	Other Supplies	100.00
3111	Travel Transportation In-State	300.00
3112	Travel Subsistence In-State	6,000.00
3400	Printing and Binding	2,000.00
3410	Photo Copying	300.00
3500	Repairs and Maintenance	400.00
3600	Freight and Delivery	200.00
5100	Office Furniture and Equipment	2,000.00
5300	Scientific Equipment	80,000.00
5400	Motor Vehicles	14,000.00

Total Operations = 119,500.00

Staff Requiremnts + Operational Support = 209,491.00/Year

APPENDIX D

INTRODUCED BY:

Referred to:

1

2 AN ACT TO APPROPRIATE FUNDS FOR THE DEVELOPMENT OF A WATER QUALITY MANAGEMENT
3 PLAN FOR THE NEUSE RIVER BASIN.

4 The General Assembly of North Carolina enacts:

5 Section 1. There is appropriated from the General Fund to the
6 Department of Natural Resources and Community Development two hundred nine
7 thousand, four hundred ninety-one dollars (\$209,491) for fiscal year
8 1985-86 and two hundred nine thousand, four hundred ninety-one dollars
9 for fiscal year 1986-87 for funding four scientific/engineering positions
10 and support of a River Basin Management Study Group. This group will
11 intensify on-going studies of the algal bloom problems in the Neuse River
12 Basin leading to the development of a "Neuse River Action Plan" by June 30,
13 1986 and a "Neuse River Water Quality Management Plan" by June 30, 1987.
14 The group will also initiate special studies in other river basins
15 experiencing water quality problems. These funds are in addition to all
16 other funds appropriated to the Department of Natural Resources and
17 Community Development.

18 Section 2. The "Neuse River Action Plan" and "Neuse River
19 Water Quality Management Plan" shall include an analysis of the
20 financial costs of implementation to point and non-point dischargers.
21 These analyses shall include a cost-benefit analysis.

22 Section 3. This act is effective upon ratification.

23

24

